REDACTED VERSION

STATE OF MAINE
PUBLIC UTILITIES COMMISSION

Docket No. 99-132

July 21, 1999

MAINE PUBLIC UTILITIES COMMISSION
Investigation Into Bell Atlantic-Maine's
Network Congestion Relief Practices

ORDER

TABLE OF CONTENTS

ATTACHMENTS

FIGURES

I. SUMMARY

We find the network congestion relief practices of New England Telephone and Telegraph Company d/b/a Bell Atlantic-Maine (Bell Atlantic, Bell, or Company) to be inadequate. In certain circumstances, Bell's response to service quality deterioration due to network congestion falls short of its obligation to provide safe and reliable service. We direct Bell Atlantic to file a report within 60 days of the date of this Order explaining how the Company will address the problems described in the Order and prevent avoidable network congestion, such as that caused by Internet traffic, and how it will respond with more appropriate speed and effectiveness should similar problems arise in the future.

II. BACKGROUND

As early as 1996, Bell Atlantic's network was being affected by rapid growth of Internet traffic, in Maine and elsewhere. One measurable effect was its impact on "dial tone speed." Dial Tone Speed (DTS) is one of the performance criteria contained in the Service Quality Index (SQI) implemented in Docket No. 94-123 by the Commission as part of the Alternative Form of Regulation for Bell Atlantic. DTS is a measure of how quickly customers are able to obtain a dial tone from their local Central Office switch. On June 24, 1997, Bell Atlantic filed a request for a waiver of the DTS benchmark in its SQI, because the Company claimed that increased Internet usage had caused actual DTS performance to deteriorate, so much so that for the 1996/97 SQI year, actual DTS was twice the benchmark. Bell did not forecast - and claimed no one could have forecast - the growth in Internet traffic and the impact that would have on its network. Bell also claimed that to manage the network to the DTS benchmark would require a substantial increase in investment in Maine.

The DTS docket was eventually resolved through a stipulation which gave Bell significant relief from the previous benchmark and which dismissed half of the penalty amount that was due for its failure to meet the benchmark in the prior year. *New England Telephone & Telegraph Co. d/b/a Bell Atlantic, Request for Waiver of Dial Tone Speed*, Docket No. 97-389, Order Approving Stipulation (June 24, 1998) (Dial Tone Speed Order). In addition, the stipulation specified that the remaining half of the penalty was to be used to promote the use of trunk-side central office switch connections by Internet Service Providers (ISPs).[1] Bell Atlantic asserted that moving ISPs to the trunk side would relieve congestion in switches. The Company agreed to develop a plan to encourage ISPs to migrate away from their more congested line-side switch connections. Bell eventually did file such a plan, which was approved by the Commission, that made it more economically viable for ISPs to move their traffic from the line sides of the switch.

In addition to the effect on dial tone speed delay caused by increased Internet usage, in 1996 Bell Atlantic had already noted other indications that more and more

[1]Attachment 1 describes the major parts of Bell's network in Maine.

customers were relying on the Internet for various aspects of daily life. For instance, both the Company's New York and New England territories exhibited extraordinary growth in access lines, call holding times, and blocked calls. In addition, the number of ISPs in Maine was growing rapidly.

On March 9, 1999, the Commission opened this investigation into how Bell Atlantic is planning for, monitoring and relieving traffic congestion on its network, particularly through its central offices. The Commission also sought to examine how Bell Atlantic has responded to customers' complaints about lack of dial tone, slow dial tone speed, excessive busy signals, calls dropped while in progress and ringing with no party on the line. The investigation was to include Bell's communication with ISPs and interexchange carriers in responding to customers' complaints. As further described below in Section VI, the investigation was triggered by numerous complaints received by the Commission's Consumer Assistance Division (CAD).[2] *Maine Public Utilities Commission, Investigation Into Bell Atlantic-Maine's Network Congestion Relief Practices*, Docket No. 99-132, Order Opening Investigation (March 9, 1999).

As part of the investigation, the Commission's Advisory Staff issued a series of data requests to gather more information. On March 24, 1999, the Hearing Examiner directed Bell Atlantic to file daily reports to the Assistant Director of CAD on the status of correcting the continuing service problems reported by eight individual customers. On April 1, 1999, the Commission held a Technical Conference to allow the Advisory Staff and the Public Advocate to ask follow-up questions to the data requests. On April 15, 1999, Advisory Staff visited Bell Atlantic's Network Operations Center (NOC) in Manchester, NH. Personnel from BA's NOC and Network Administration Center (also in Manchester) provided information to the staff about the functions of their departments. On May 5, 1999, Advisory Staff members met with Bell Atlantic's Director of Operations for Maine, New Hampshire and Vermont who provided information on the Company's Quality Analyzer and Repair Center functions.

On April 27, 1999, the Commission issued an order directing the Advisory Staff to prepare an Examiner's Report recommending specific steps for Bell Atlantic to address the problems that network congestion has caused customers, the most serious being inability to obtain dial tone.

[2]The complaints were made by customers in communities served by "remote" switches. The Commission has received no congestion-related complaints from customers served by Bell's large "host" switches, and has no evidence that any host switch has become congested by Internet traffic.

The Order stated that the initial investigation found:

> 1. Ineffective internal communication about network congestion problems among Bell Atlantic's network monitoring operations, its repair service centers, and its marketing operation;
>
> 2. Inadequate switch management practices and congestion relief practices that either fail to fully relieve congestion or take too long to complete; and
>
> 3. Lack of a comprehensive long-term plan for predicting, addressing and ultimately preventing long-term capacity shortages that cause network congestion.

Docket No. 99-132 Order (April 27, 1999).

On June 9, 1999, the Advisory Staff issued a report containing its findings in these three areas and suggested approaches for addressing these problems.

III. NETWORK CONGESTION AND ITS IMPACTS

Congestion occurs in a telephone network when calling demand exceeds the network's call handling capacity. The congestion choke point in the network is the local exchange switch, which routes calls to their destinations. When a switch is congested, some calls do not go through and are blocked. Calls can be blocked if the lines connecting the switch to another switch in the network are all in use. But according to Bell Atlantic, the major points of congestion are the "Line Concentration Units" - components that connect customer lines directly to the switch. The line unit is a "shared resource": the lines connected to it share a limited number of paths into the switch. If there are 640 lines connected to the line unit and they share 64 paths into the switch, then when 64 lines in that line unit are in use, all other call attempts made over any of the other 576 lines will obtain no dial tone or delayed dial tone, and calls made *to* those lines will obtain a fast busy signal as soon as they dial, which indicates a congested switch. No call will go through that line unit until one or more callers using the paths into the switch hang up.

Besides the fast busy signals (blocked calls), other symptoms of switch congestion are: no dial tone; slow dial tone; ringing with no one on the line; and disconnected or lost calls.[3] Although all these events reflect inadequate service, which is a concern to us, we are most concerned with blocked calls and with no dial tone and slow dial tone events, which can reflect *unsafe* service, wherein callers may get no dial tone or a fast busy signal when they need to make emergency calls.

Bell Atlantic has contended the rapid growth in Internet traffic is the principal cause of switch congestion. Bell has stated that the call handling capacity of its local exchange switches has traditionally been sized to handle voice calls averaging 4 to 5 minutes (referred to as "call holding time.") Internet calls are typically much longer -- averaging 45 minutes, according to Bell, or 10 times the switch's *designed* call holding time -- so that heavy Internet traffic, particularly during a switch's peak period, can overload the switch's call handling capacity and cause it to become congested.

The impact of the Internet on switch congestion is most severe when both Internet users and their Internet Service Providers (ISPs) are served by the same switch over common voice lines. Internet users' calls may have extremely long holding times, but after they end, the paths into the switch they were using are freed up for other callers. During peak periods, the ISPs' lines are almost always in use, and therefore the paths into the switch they are using are almost never freed up. As a result, during peak periods or when Internet use is high, customers whose lines are assigned to a line unit that has ISP lines in it will be the most likely to have their call attempts blocked.

As for the impact of Internet *users* on switch congestion, many customers have obtained an extra telephone line strictly for accessing the Internet. If those Internet

[3]The last two named events may or may not be symptoms of switch congestion. They have been reported, however, in customer complaints that have included complaints of blocked calls (fast busy signals), no dial tone, and slow dial tone.

users stay connected for hours at a time, or worse, if they stay connected all day long, they will tie up paths into the switch, which – especially during peak periods – will increase the likelihood of network congestion.

IV. BELL ATLANTIC'S CONGESTION RELIEF PRACTICES

Once a switch becomes congested Bell Atlantic uses a number of methods to attempt to relieve the congestion; each method is described below.

A. Load Balancing

If Bell determines a line unit is blocking a high percentage of calls, "load balancing" is a process of moving high use lines from that line unit to other line units that are experiencing less blocking. According to Bell, it can take up to six weeks to determine whether trunks or line units are causing congestion, which lines are causing it, and to which line units should be re-assigned.

B. Converting Analog Lines to Digital Lines

The "concentration ratio" of a line unit is the ratio of the number of lines in the line unit to the number of paths into a switch. According to Bell, because there are far fewer digital lines than analog lines going into the switch, digital line units have lower *effective* concentration ratios than analog line units. Therefore, converting analog lines to digital can help relieve congestion caused by analog line units with high blocking rates.

This method of congestion relief appears to be quite limited. If digital facilities are available in an exchange's outside plant and at the switch, Bell can implement this method directly to relieve congestion on analog line units. Converting analog (copper) lines to digital (fiber) lines is also driven by other operational concerns, such as the need to replace deteriorating copper cable or the decision to provision facilities to a new housing or commercial development on digital lines. In such instances, any resulting congestion relief would therefore be a by-product of addressing other operational concerns.

C. Moving ISPs to the Trunk Side of Switches

Two types of lines are connected to a local exchange switch: lines from homes and businesses, and lines (called "trunks") from other switches, which are typically high capacity lines. The impact of Internet traffic on a switch is much greater if an ISP's connections to the switch are over access lines rather than higher capacity - and *non-blocking* - lines on the trunk side of the switch. The reason is that when Internet use is high, ISP access lines are almost always in use, each receiving one Internet call after another, thus tying up the limited paths into the switch and causing the line units to which the ISP's lines are assigned to block calls. According to Bell, moving an ISP from the line side to the trunk side of a switch relieves a major source of call blockage from the switch's line units.

This method of congestion relief, although it can immediately and dramatically improve a congested switch's performance, is limited by the ISP's

willingness and ability to invest in digital routers (to replace analog modems), which can cost as much as $30,000 each, and to absorb the higher monthly rates of the digital trunk side connections to the switch. It can take months for an ISP to decide whether to make these investments.

D. Capacity Upgrades

If a combination of the above methods does not relieve the congestion in a switch, Bell can add one or more line units to increase the switch's call handling capacity. A single additional line unit costs about $70,000, and delivery and installation can take up to six months from the day it is ordered.

E. Remove High Use Lines from the Switch

If Bell determines the impact on a switch of certain high use access lines threatens to cause unsafe service, Bell's tariff allows it to disconnect those lines from the switch.[4] This is a severe measure, which, according to Bell, has been implemented only rarely.

[4]Bell's tariff states:

> The Telephone Company reserves the right to discontinue or refuse service . . . [if] [t]he use of the service [is] in such a manner as to interfere unreasonably with the use of the service by one or more other customers.

Part A, Section 1.3, Use of Service, Tariffs PUC-ME-No. 15, New England Telephone and Telegraph Company d/b/a NYNEX.

V. BELL ATLANTIC'S SWITCH MANAGEMENT AND MONITORING OPERATIONS AND REPAIR CENTERS

A. Network Operation and Administration Centers

Bell Atlantic monitors all 399 of its switches in Maine, New Hampshire, Vermont and Rhode Island at its Network Operations Center (NOC) and Network Administration Center (NAC), which are co-located in Manchester, NH. The switches are monitored in "real time," 24 hours a day, 7 days a week by 5 to 6 persons in each center, using a computerized system that checks hundreds of switch, switch peripheral, and trunk and line termination unit performance measurements.

The NOC staff detect and initiate repairs of malfunctioning or failed equipment. The NAC staff detect equipment that is functioning, but not functioning within established performance thresholds. It is the latter condition that constitutes the major cause of network congestion. Thus, it is the NAC that detects and confirms switch congestion, and evaluates which line units, and which lines assigned to each line unit, are causing the congestion. The NAC also directs load balancing efforts, and, if load balancing does *not* relieve the congestion in a switch, it recommends capacity upgrades to Bell's Switch Planning and Capacity Management Department, which is responsible for timing and sizing the capacity of switches and umbilical trunks and of capacity upgrades.[5]

The NOC and the NAC use the same switch monitoring system and data base (called "TDMS," for Traffic Data Management System). When a switch performs outside established thresholds, the TDMS generates "exceptions reports," which the NAC uses to determine if a switch is congested or becoming congested.[6] NAC's performance thresholds appear to be set as warning levels, not to reflect inadequate or unsafe service levels. Thus, presumably, some switching performance measurements can be outside established thresholds and yet the switch may still function properly. Bell has not developed unsafe service performance thresholds for the switch measurements that reflect network congestion, i.e., thresholds that might trigger immediate congestion relief. Nor are Bell's switches able to measure *no dial tone* events; instead its switches count no dial tone events as if they are *delayed* dial tone events.

B. Repair Centers

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[5] "Umbilicals" are trunks that connect the smaller "remote" switches to the much larger and more powerful "host" switches.

[6] Of the hundreds of network performance measurements the TDMS monitors, relatively few appear to *directly* monitor network congestion, therefore switch and trunk congestion may be only two of many events the exception reports cover. The TDMS generates exception reports every 30 minutes. Therefore, for just one of the 399 switches the NAC must monitor, the TDMS may generate hundreds of exception reports in a matter of a few days.

To respond to its customers in Maine, New Hampshire, Vermont, Massachusetts, and Rhode Island who call to report service problems, Bell operates a "Centralized Service Bureau" in Andover, Massachusetts, with an overload center in Tewskbury, Massachusetts, staffed by customer service personnel. According to Bell, the customer service intake personnel normally test the customer's line whenever a trouble call is received, regardless of the nature of the complaint. Intake personnel do not try to diagnose the problem or provide any information to callers about problems related to network congestion, even if the call comes from an area where Bell knows network congestion exists. The dialog and procedures used by customer service intake personnel seem to be unchanged from the pre-Internet time period, when problems caused by network congestion were rare; thus the procedures seem to concentrate only on access line and inside wire related problems, and not on problems caused by congestion in switch and network facilities. Customers may be told that troubles are "cleared" in instances where the problem is network- or switching-related, and yet nothing has been done to relieve the root cause of the trouble. Bell Atlantic states the repair center intake personnel pass network-related troubles on to the Network Operations Department in Manchester, New Hampshire. However, Bell has yet to respond to a Staff data request on how Network Operations personnel follow-up with customers on their trouble reports.

VI. CUSTOMERS' COMPLAINTS AND BELL ATLANTIC'S RESPONSES

A. Customer Complaints

On December 16, 1998, the owner of a mail-order business in Houlton, Maine, filed a complaint with the Commission's Consumer Assistance Division (CAD) regarding her Bell Atlantic telephone service. Specifically, she complained that incoming calls on her 800-line were sometimes being dropped after one ring, that she could not obtain a dial tone at times to make outgoing calls, and that customers were not able to reach her over her 800 number during office hours. She also complained that Bell Atlantic staff had been investigating the problem since early summer 1998 and had been unsuccessful in determining and correcting the problem.[7]

In early February, 1999, the CAD became aware of three other businesses in the Houlton area having similar problems with their phone service. All three (a bank, a telemarketing company, and a regional hospital) reported that they were having incoming calls dropped after one ring, having difficulty at times obtaining dial tones to make outgoing calls, and periodically receiving an "all circuits busy" recorded message when making outgoing calls. In addition to these complaints, the CAD had been contacted by the Southern Aroostook Development Corporation about other businesses in the Houlton area that had been experiencing similar problems.

The CAD initiated an informal investigation of these complaints to ascertain the cause of the problems, particularly the problems being experienced by the original complainant, the mail order business. Bell Atlantic, as well as AT&T,[8] conducted tests on the lines of the mail order business to determine the cause of the problems. This work was in addition to the work already conducted by Bell technicians throughout the summer and fall of 1998.

On February 10, 1999, in a phone conversation with the Assistant Director of the CAD, a Bell engineer indicated that the Company had "figured out" that the cause of the customer's problem was an overloaded switch in the Houlton central office. The engineer added that the Bell staff in charge of managing the Houlton switch had been aware of the problem for "quite some time" and were negotiating with a local ISP to move its lines to the trunk-side of the switch to reduce the traffic through the line-side of the switch. The engineer indicated that Bell staff believed that this measure would alleviate the switch congestion problem. This information raised concerns with the CAD staff because they had been working on this customer's problem with Bell Atlantic since

[7] In the fall of 1998, the business owner indicated that a Bell technician working on her lines told her that the problem wasn't in her lines, but was actually in the local switch. She said that the technician said that the problem was congestion in the Houlton switch and until additional equipment was added to the office in Houlton, the problems would continue.

[8] AT&T is the customer's intraLATA and interLATA toll carrier.

December 16, 1998, and this was the first time that Bell staff mentioned to CAD that Houlton was experiencing switch congestion problems.

On February 12, 1999, the Commission sent a letter to Edward Dinan, President of Bell Atlantic-Maine, asking that Bell:

1. Take immediate action to remedy the congestion problem in the Houlton central office switch;

2. Inform the Commission of congestion problems in any of Bell Atlantic's other central office switches; and

3. Provide a written description of BA's efforts to ascertain the problem in the Houlton switch and the steps that would be taken to remedy the problem.

B. Bell Atlantic's Responses

In response to the Commission's letter, Mr. Dinan indicated in a February 23, 1999 letter that "Bell Atlantic has been aware of network congestion in the Houlton switch and has taken steps to remedy the problem caused by Internet traffic." Mr. Dinan added that "Houlton currently has **[Begin Proprietary] [End Proprietary]** line units blocking at **[Begin Proprietary] [End Proprietary]** leaving no facilities available for the transfer of the higher users.[9] Bell Atlantic has identified **[Begin Proprietary] [End Proprietary]** to be a significant contributor to this overload condition resulting from the increased Internet usage holding time." To address the congestion problem in Houlton, Mr. Dinan indicated that Bell Atlantic was negotiating with the ISP to convert its lines to Flexpath service as an interim solution until additional ISDN-PRI capacity could be installed **[Begin Proprietary]** .**[End Proprietary]**[10]

Mr. Dinan's letter also stated that Bell was unable to add enough digital lines to the Houlton switch to meet the planned upgrade because the Company "discovered" that the manufacturer of the necessary equipment (Digital Loop Carrier

[9]This was later corrected by Bell; these were blocking rates for the *Sedgwick* switch's analog line units. Response to Advisory Staff 2-7.

[10]"Flexpath" is Bell's trade name for a high speed digital service that it provides off the trunk sides of its switches. "ISDN," which stands for Integrated Services Digital Network, is a trunk-side digital service that delivers voice and data signals simultaneously. "ISDN-PRI" (PRI stands for Primary Rate Interface) is a high capacity ISDN service. **[Begin Proprietary]**
[End Proprietary]

Units) had discontinued it. The letter also said Bell's underestimation of actual line growth in the Houlton exchange led to a shortage whose impact was "exacerbated by the fact that Houlton is experiencing its 'Winter' busy season and peak traffic load."

Subsequently, in response to staff data requests, Bell revised the reasons for the delay in upgrading Houlton's digital lines to meet forecasted demand. The revised reasons were: a shortage of available digital cable facilities; a "re-prioritization" of work in the wake of the 1998 ice storms; and the outside plant work force being engaged in projects with "higher priority," such as "completion of SONET rings to decrease the vulnerability of portions of BA-ME's interoffice network."[11]

Mr. Dinan also identified switch congestion problems with Bell Atlantic's Sedgwick switch and Somersworth, New Hampshire switch, which serves Berwick. To address the problem in Sedgwick, Bell Atlantic was negotiating with an ISP to move its business to Flexpath service, as well as planning to add capacity to the switch **[Begin Proprietary] [End Proprietary]**. For Berwick, Bell Atlantic would be adding additional capacity to the Somersworth switch **[Begin Proprietary]** .**[End Proprietary]**[12] In addition to the Houlton, Somersworth and Sedgwick switches, Mr. Dinan also identified 14 other central offices as having possible switch congestion problems due to increased call blockage and/or dial tone delay experienced by customers during the busy season of each office. To address the potential switch congestion problem in these offices, Bell Atlantic planned on implementing load balancing and adding line units to increase call handling capacity.

Between February 11, 1999 and April 1, 1999, the Commission became aware of two other businesses in the Houlton area, five customers in the Berwick area, and one customer served by Bell's Old Town switch that were experiencing problems with their telephone service similar to the problems associated with switch congestion.

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[11]We will return to this subject in the next section (Section VII.B.3.). "SONET" stands for Synchronous Optical NETwork and is an ultra-high capacity fiber-optic transmission technology.

[12]Bell's responses to Staff data requests revised Mr. Dinan's letter with regard to the Somersworth switch. Bell determined additional umbilical trunks to its "host" switch in Dover, NH, were necessary, were added in February, and that the additional capacity (line units) will not be installed until **[Begin Proprietary]** .**[End Proprietary]** [Staff 2-13]

C. Daily Reports

On March 24, 1999, the Hearing Examiner ordered Bell Atlantic to fax a daily report to the Assistant Director of the Consumer Assistance Division summarizing the status that day of each of eight customers' complaints: three located in Houlton, four in Berwick, and one served by the Old Town switch. The first report described the status of the complaint as of that day. Each subsequent report described actions taken the previous day to address each customer's complaint, the substance of any contact Bell Atlantic had with the customer that day, the results of the contact, and any planned activity. If nothing had changed from an earlier report, that was also noted.

On March 30, the customer served from the Old Town switch was removed from the report list when his problem was resolved.[13] On April 5, one of the Houlton customers was removed from the list when Bell Atlantic learned that the complainant was not *its* customer, but a customer of a local exchange reseller of Bell Atlantic services. By April 21, 1999, two of the customers from Berwick had also been removed from the daily report list; one reported that her problem had been resolved, the other asked that Bell Atlantic not call anymore.

On June 24, 1999, the Hearing Examiner issued a Procedural Order allowing Bell Atlantic to cease daily reporting.

[13]BA-ME President Dinan's 23 February letter to the Commission indicated the Old Town switch was one of 12 "potentially congested" switches. It was from a daily fax in late March, however, that the Commission first became aware that the Old Town switch *was* congested. Bell reported it had added a line unit to the switch and had ordered the load balancing of 170 lines. A few days after that load balancing was completed, Bell ordered the load balancing of an *additional* 150 lines.

VII. RESULTS OF INVESTIGATION

A. Lack of Reporting on Network Congestion Between the NOC/NAC and the Customer Service (Repair) Bureaus and Marketing and Sales Operations

Bell's responses to Staff data requests indicate the Company has no procedures that require either the Network Operation Center or the Network Administration Center to report to either the Centralized Service (Repair) Bureau or Bell's marketing and sales agents about switches that are congested. The lack of formal reporting procedures for communicating the existence of network congestion to the key operational units that interact with customers exacerbates the problems caused by congestion. This has two consequences: if a customer reports a congestion-related problem to the repair center and the customer service person taking the call does not know the caller's switch is congested, *and* does not recognize the problem is related to network congestion (and *not* to the customer's equipment, or inside wire, or the lines connecting the customer to the central office switch), that customer service person cannot give the customer correct and accurate service and information.

The other consequence of neither the NOC nor the NAC reporting switch congestion to other operational units is that Bell's marketing and sales agents will continue to fill orders from ISPs for *additional* lines on switches the NOC and NAC may already know to be congested by ISPs' high use lines.

Bell Atlantic has acknowledged that switch congestion is a growing problem in Maine. *See* Dial Tone Speed Order. According to Bell, however, no one internal group is in charge of identifying and correcting problems created by network congestion caused by excessive Internet traffic or other traffic. Instead, a joint review of network functions by the NAC, the NOC, and regulatory personnel is necessary to identify a congestion problem caused by Internet traffic or underbuilt plant.

That process is inadequate: *input* from these groups is doubtless needed to plan and manage congestion relief activities, but the ultimate authority and responsibility for *executing* those functions should be assigned not to a committee of groups, but to a single group. However Bell chooses to manage congestion relief, effective reporting and communication between these groups and Bell's repair center and marketing operations is critical to contain and relieve network congestion as soon as possible.

B. Problems with Bell's Network Monitoring System

Bell's Network Administration Center is charged with detecting network congestion. This is done primarily with the "exception reports" Bell's computerized network monitoring system (TDMS) generates when network components - such as switch module links, analog and digital line units, umbilical and interoffice trunks - do not perform within established thresholds.

The TDMS generates exception reports every 30 minutes. As a result, in a matter of a few days the TDMS may generate hundreds of exception reports on a single switch, and five or six NAC personnel must examine hard copy exception reports for each of Bell's 399 switches in Vermont, New Hampshire, Maine, and Rhode Island. There is no program in the TDMS (or external to it) that digests or reduces the exception reports' data to a single switch that may be congested, and that analyzes the trends in that data graphically or statistically. Thus, the monitoring system does not appear to be designed to *forecast* or *predict* network congestion. The physical examination of hundreds of exception reports for 399 switches by a handful of people makes detecting network congestion a cumbersome, time-consuming process and suggests the TDMS has not been optimized for detecting network congestion.

According to a NAC Staff Manager, once evidence of possible congestion *is* detected, it can take up to six weeks to confirm congestion exists in one or more network components, and, if line units are congested and load balancing is available as a congestion relief option, to determine which lines are causing it, and which of those lines should be transferred to other line units. If load balancing does not *fully* relieve the congestion in the switch, customers served by the switch will have to endure the effects of the congestion until Bell either adds line units - a process that can take up to six months - or Bell is able to convince any ISPs served off the line side of the switch to move to the trunk side, which (assuming the ISPs agree to it) can also take several months.

If load balancing does not relieve the congestion on a switch, and *only* additional line units will do so, the NAC will recommend the necessary line unit additions to network planners in Bell's Switch Planning and Capacity Management Department. The NAC Staff Manager indicated "a tension" can surface between the NAC and the network planners on the need or timing for line unit additions. The planners - who time and size capacity additions for *all* Bell Atlantic's switches and umbilicals - may question whether the NAC has done enough load balancing and decide not to approve and plan the recommended capacity upgrade immediately.

The same Bell network planning group that sized a switch's capacity and its capacity upgrades is not in the most objective position to decide, based on *another* group's recommendation, that the switch's capacity is *undersized* to meet peak traffic loads and therefore that it needs a capacity upgrade immediately. Thus, when the Network Administration Center and the network planners disagree on the need for upgrading a congested switch's capacity, or on its timing, *a third party* in Bell Atlantic should make the decision, not the network planners, who may have underestimated the switch's actual busy hour traffic load and undersized the switch's capacity or mis-timed a capacity upgrade.

C. Problems With Bell's Switch Management Practices

1. Bell Has Undersized the Capacity of Some Switches

Switch congestion, when it occurs, is not an all-day event; rather it usually occurs only during peak calling periods. It is the magnitude of the traffic in those busy periods, however, that the switch's call processing capacity must be designed and sized to handle without the switch becoming congested. A switch's "busy season" is the three months of the year (not necessarily consecutive) when calling demand is highest; the switch's "high day" is the busiest day in the busy season (excluding holidays, special event days, extreme bad weather days, etc.); the switch's "busy hour" is the busiest hour in the high day. An engineer planning the call handling capacity of a switch would determine its busy hour, and then size the switch's capacity to be able to handle the magnitude of traffic expected during that busiest of hours, and therefore during all other hours in the year. If the engineer underestimates the busy hour traffic load, then the switch will be congested during the busy hour, and probably in other busy periods during the year.

Bell Atlantic's maximum blocking standard for a local switch's line concentration unit is 4%. Therefore, if the switch has been sized with enough line units to meet peak calling demand, it should block, at most, 4% of calls during the periods of peak calling. For the three switches for which the Staff obtained performance data from Bell (Houlton, Sedgwick, and Somersworth, NH (which serves Berwick)), Bell's "high day" reports showed line units with blocking rates that are many times higher than the Company's blocking standard. Thus, the call handling capacities of those switches appear to have been sized well below the capacity required to serve high day-busy hour traffic loads that actually occurred at each switch.[14] The effects of whatever load balancing was done on those switches was not enough to relieve the congestion during those peak calling periods.

2. Management of ISP Traffic Inadequate

Bell has recently succeeded in convincing ISPs served by the Houlton and Sedgwick switches to change their switch connections from common voice lines to high capacity trunk-side connections. Line unit blocking data Bell has provided on the Sedgwick switch indicates it is no longer congested. Bell has provided data on blocked calls showing that the Houlton switch is also no longer congested, and, the Company claims that the Somersworth, NH switch is blocking 85% fewer calls.

The Somersworth switch does not serve any ISPs; therefore, congestion in that switch cannot have been caused by ISPs tying up line units and paths into the switch. That congestion was apparently caused by an insufficient number

[14]The High Day Reports Bell provided in response to Staff data requests covered the period from 10/22/98 to 3/15/99, and show the 15 highest days' busy hour usage and blocking rates. Some of those days may have been bad weather days (none appeared to be holidays or special event days), but not all were.

of umbilical trunks between the Somersworth switch and its "host" switch in Dover, NH, and by an insufficient number of line units on the Somersworth switch. Both of those call handling capacity deficiencies have caused dial tone delays and blocked calls, and both are a result of Bell having underestimated peak calling demand into and out of the Somersworth switch. Indeed, shortly after Bell added umbilical trunks to the Somersworth switch, it determined *more* umbilicals would be needed. But because the switch lacked the infrastructure necessary to provision the additional umbilicals, that equipment had to be ordered, thus delaying the necessary umbilical capacity upgrade. During the same period, Bell also determined the Somersworth switch needed an additional switch module and line units, a major capacity upgrade.

This and other examples of Bell's response to network congestion suggest that, at least on some of its switches, the Company is not *planning* for increases in traffic loads, such as those caused by the growth in Internet traffic, but is *reacting* to actual peak traffic loads that cause switches to become congested or potentially congested. Wherever load balancing does not fully relieve the congestion, customers served by those switches have to endure the effects of congestion until Bell can get the necessary capacity upgrades sized, ordered, delivered, equipped and installed.

Bell's management of the capacity of the Sedgwick switch is instructive. The Sedgwick switch is a small switch that has **[Begin Proprietary] [End Proprietary]** analog line concentration units. In order to meet the needs of its Internet customers, an ISP served by the switch ordered more and more access lines, until it had about **[Begin Proprietary] [End Proprietary]** lines. During periods of high Internet traffic, the switch's **[Begin Proprietary] [End Proprietary]** analog line units became extremely blocked, and because **[Begin Proprietary] [End Proprietary]** were blocked, it eliminated load balancing as a means of relieving congestion.

Had Bell Atlantic been unable to convince the ISP to make the investments necessary to move its service to the trunk side of the Sedgwick switch, it would still be as highly congested as it was before -- and it would have remained congested until Bell Atlantic increased the switch's call handling capacity by installing at least one more line unit, a process that can take up to six months. If, after determining the switch was congested, Bell had instructed its marketing department or its sales agents to take no further orders for additional lines from the ISP until the congestion was relieved, that action might have at least kept the congestion on the Sedgwick switch from getting to such extreme levels.

We have characterized network congestion caused by Internet traffic as avoidable; Bell Atlantic has argued that it was not and is not. Bell states that it could not have predicted where ISPs in Maine would locate, from which switches they would want to be served, how much traffic each ISP would impose on each switch, and how fast that traffic would grow.

We agree with Bell Atlantic up to a point; we do not expect perfect foreknowledge. But, although *100%* of Internet-related congestion may not have been avoidable, or predictable in all its particulars, we believe this Order shows how Bell could have avoided *much* of it, and been prepared to react more quickly and effectively to the impact on its network of growth in Internet traffic.[15]

Bell Atlantic realized as early as 1996 that the increasing use of the Internet would have a significant and deleterious impact on its network - unless steps were initiated to address the matter and prevent Internet-based network congestion. Because several of Bell's switches in Maine have become congested and several others potentially congested, the steps the Company *has* taken - principally, re-balancing the traffic loads on its switches, adding line units and, recently, convincing ISPs to accept trunk-side serving arrangements - have either been inadequate or have taken much too long to complete.

3. Congestion Relief Should be Given a Higher Priority

We return here to a point discussed above in Section V, namely, Bell's management of the Houlton switch. We focus particularly on the Company's forecast having substantially underestimated actual line growth and to the reasons given for delays in adding digital lines, such as shortages of digital cable facilities and the higher priority given to SONET ring construction.

We have three specific concerns: 1) Bell Atlantic's underestimation of line growth on a switch it had known - since 1997 - to be congested; 2) the unavailability of digital lines needed to turn up the digital carrier line unit *for a planned growth job;* and 3) the subordination of the relief of a congested switch to a planned construction project. The immediate relief of *existing congestion* in Bell's network, which can result in blocked calls, delayed dial tone, and no dial tone, should be given a priority equivalent to the priority Bell would give to an emergency.

[15] Indeed, Bell's argument that it is impossible to predict the exact location and magnitude of Internet traffic demonstrates why it is so urgent that the Company have systems in place that can detect switch congestion in its early stages and remedy the problem promptly.

D. Lack of a Bell Atlantic Corporate-Level Coordinated Response to Network Congestion

1. Bell Has Not Attempted to Control The Growth of ISP Lines on Congested or Potentially Congested Switches

Bell contends the growth in Internet traffic, and in particular the growth in voice line switch connections of ISPs, is the principal cause of switch congestion. Yet Bell's marketing and sales agents do not routinely identify ISPs *as* ISPs when they order access lines. As a result, even for a switch that may already be congested, an ISP, whose many line-side connections on that switch may be causing the congestion, will be able to order *additional* lines, which of course will exacerbate the congestion.

As indicated earlier, Bell's Network Operation and Administration Centers do not routinely notify the marketing and sales agents that a switch has become congested. If a sales agent *knows* the company ordering lines is an ISP, and even if Network Operations is aware that the ISP's serving switch is congested, Bell states it cannot refuse the ISP's order for additional lines. Bell's tariff, however, which we referred to in Section IV and repeat here, indicates quite the opposite. The tariff states: "The Telephone Company reserves the right to discontinue or refuse service . . . [if] [t]he use of the service [is] in such a manner as to interfere unreasonably with the use of the service by one or more other customers." Thus, in our view, Bell does have both the authority and the *obligation* to limit ISP line-side growth on switches it knows to be congested or potentially congested: (a) when immediate congestion relief is necessary and (b) until other forms of congestion relief, including capacity upgrades, can be accomplished.

2. Bell Does Not Restrict Its Access Line Promotion Programs to Customers Served by Uncongested Switches

Well after the growing impact of Internet usage on network congestion had taken hold in Maine, Bell filed tariffs with the Commission that waive the service and installation charges for additional residential and business lines. These programs provide incentives for residential customers to add a second or third line, and for business customers - including ISPs - to add up to two additional lines. The promotions are unrestricted: residential and business customers, including ISPs, who are served by a switch that may already be congested or potentially congested, can take advantage of the promotions. Thus, Bell Atlantic's promotional tariffs for additional business lines create an incentive for an ISP, whose lines may be causing congestion in a switch, to add more lines at the expense of causing more congestion.

3. Service Quality Concerns Raised by Mergers and Bell's Centralization of Network Management

In Docket No. 96-388, the Commission approved the merger of NYNEX into Bell Atlantic. In the Order granting the approval, the Commission included a discussion of the concerns expressed by the parties to the proceeding regarding the effects that the merger might have on service quality and network reliability. One of the concerns expressed was that because Maine's infrastructure was already in good condition, the merged company might have less incentive to invest in Maine. Reduced competition could also result in less incentive to invest in Maine, and the merged entity might invest its capital in other ventures that offered higher potential returns. Another concern was that Bell Atlantic would concentrate its attention on other jurisdictions, because Maine would be a much smaller part of the merged entity.

To address these concerns, the Commission required that Bell Atlantic continue its investment in Maine at the same level as it had over the previous four years.[16] In addition, a service outage measure that the Commission had initially ordered in the AFOR docket was to be implemented on an expedited basis. Also, the Commission ordered that its outage reporting rule for telephone utilities, Chapter 20, be revised to include additional outage reporting requirements. Finally, the Commission ordered that Bell Atlantic design a report of benchmarks that would compare facilities, services and prices in Maine with those in the remainder of the Bell Atlantic territory. In sum, the Commission clearly was concerned that service quality and service availability might be negatively affected by the merger, and it included conditions in its merger approval designed to prevent such deterioration.

We cannot conclude from the evidence before us that the switch congestion problems under investigation in the current case are a result, direct or indirect, of the Bell Atlantic/NYNEX merger. Some organizational restructuring done by the merged company, however, may have contributed to Bell's failure to identify network congestion in Maine at an early enough stage to allow for remedial action before the problem reached a critical point. Bell Atlantic has increased the territorial coverage of several managers who have responsibility for planning the network and for identifying and correcting network problems.

For example, Operations is the department responsible for the provisioning, maintenance and repair of outside plant. Prior to the Bell Atlantic/NYNEX merger, there was a Director of Operations for Maine. Now one person is responsible for Maine, New Hampshire and Vermont, overseeing the work of approximately **[Begin Proprietary] [End Proprietary]** employees in each state. Similar situations exist in Network Operations, Construction and Engineering; one person is in charge of Switch and Umbilical Planning and Capacity Management, and one person is in charge of Interoffice Facilities Planning and Capacity Management, both for the entire Bell Atlantic footprint. A single individual has responsibility for a much larger geographic area than was previously the case.

[16]This requirement was subsequently rescinded through the Commission's approval of a stipulation in Docket Number 94-123 (Reopened) that dealt with the reduction in access charges required under Maine law.

We are not criticizing any of these individuals, nor any of the hundreds of Bell employees who plan, manage and maintain Bell's network. It is possible, however, that the Company's more centralized network management structure may have led to an inability to identify and rectify switch congestion problems in a timely manner - much less to prevent congestion from occurring. As discussed earlier, the Company's primary short-term solution was to rely on load balancing, even as it became evident in certain exchanges that this alone would not be sufficient, and that either additional line units or the movement of ISPs to the trunk sides of their serving switches would be needed. Of course, the Company would have had to reach that conclusion far earlier than it did, given the long lead time involved both for ordering and installing line units and convincing ISPs to change their serving arrangements. We are not able to say whether the cause of the congestion in Bell's Maine network resulted from lessened attention to Maine-specific issues, Bell's highly centralized network management, or a general company policy to delay line unit additions as long as possible, but it is clear that at least in the Houlton, Sedgwick and Somersworth switches, congestion reached an unacceptable level without the merged Bell Atlantic-NYNEX Company having taken adequate action early enough to prevent it.

Now, Bell Atlantic's shareholders have approved a proposed merger with GTE, which the Commission has stated it will likely approve if the Department of Justice and the Federal Communications Commission give their approvals.[17] DOJ has recently given its conditional approval, subject to the divestiture of certain cellular properties. Because Maine would become an even *smaller* part of a consolidated Bell Atlantic-GTE and because the merged Bell Atlantic-NYNEX company allowed parts of its Maine network to become congested by Internet traffic, we may need to address, either in this proceeding or the pending Bell Atlantic-GTE merger, Docket No. 98-808, whether to take more concrete steps to ensure that Maine's infrastructure and service quality needs are not neglected.

[17]Prior to Commission approval, the Commission will consider arguments concerning any concerns specific to Maine raised by proposed intervenors. *See New England Telephone and Telegraph d/b/a Bell Atlantic Maine, Notice of Merger with GTE*, Docket No. 98-808, Order on Reconsideration (Mar. 18, 1999).

VIII. PROPOSED ACTIONS

We offer the suggestions below for Bell Atlantic to consider in addressing the problems identified in this Order. The suggestions focus on improving Bell's internal reporting and communication on network congestion, on improving and speeding up its approaches to detecting and relieving network congestion, and on improving its long-term approaches for preventing avoidable causes of network congestion, such as growth in Internet traffic. We emphasize these are merely *suggestions* for Bell's consideration. Our focus is on achieving *substantial improvements* in these areas. How Bell accomplishes the improvements is entirely up to the Company. If, however, Bell's plan does *not* achieve the levels of service to which customers are entitled, whether or not Bell has adopted any or all of the suggestions, the Commission will consider sanctions against the Company, including the possibility of rebates to customers.

A. To Improve Bell's Internal Communications on Network Congestion

We suggest Bell consider:

1. That when Bell's Network Administration Center determines a switch in Maine is congested or potentially congested, the NAC report it to the Centralized Service Bureau (repair center) and the Company's marketing operations. With that information (i) repair intake personnel will be able to give accurate information, advice, and service to customers served by the congested switch who call to report congestion-related problems, and (ii) Bell's marketing and sales agents will be able to suspend sales of access lines to ISPs served by the switch, and thus contain the congestion.

2. That Bell's Centralized Service Bureau develop a reporting system that collects, statistically summarizes, analyzes, and graphically trends reports of customers' troubles caused by network congestion. The reports could be generated by wire center; reference the *thresholds* for no dial tone, delayed dial tone, blocked calls and other congestion-related events, and sent to Network Operations, the NAC, network planners (the Switch Planning and Capacity Management Department), and the Marketing and Regulatory departments. The reports' statistical summaries and trended information could give the groups that manage congestion relief efforts and that plan the capacity of the network an up-to-date, graphic assessment of the actual problems that network congestion is causing Bell's customers in Maine.

B. To Improve Bell's Short-Term Approaches to Detecting and Relieving Network Congestion

1. Network Management

a. Bell should develop a plan to address existing and potential congestion. We suggest Bell consider that the plan:

(1) assign the responsibility and authority for the planning and management of network congestion relief to a *single* group in the Company, not, as is currently the practice, to a committee of network operations, network administration and regulatory personnel.

(2) specify the particular responsibilities of each Company group in detecting and relieving network congestion and reporting information to the other groups;

(3) designate specific individuals in each group to be responsible for detecting and addressing congestion problems; and

(4) address detecting and relieving network congestion on an immediate, short-term basis, as well as preventing congestion on a long-term basis.

b. Bell Atlantic should manage its switches to its maximum line unit blocking standard of 4%. If the cause of switch congestion is in the switch's line units and load balancing efforts are not expected to fully relieve the congestion, and only additional line units will provide full and immediate relief, we suggest Bell consider taking steps to have line units readily available to install on the switch. The up-to-6-month lead time for getting additional line units justified, approved, ordered, equipped, furnished, and installed is unacceptable; customers served by a congested switch should not have to wait six months to be free of the problems and hazards congestion can cause.

c. If Bell determines that a switch is congested by ISP line-side switch connections, that load balancing will not fully relieve the congestion, and that additional line units or other congestion-relief steps are not readily available, we suggest Bell consider invoking its tariff and *temporarily* remove enough ISP lines to relieve the congestion. We recommend this as an emergency measure only, and not as a way to deal with capacity shortages.

d. If a switch is potentially congested by ISP line-side connections, we suggest Bell consider invoking its tariff and temporarily limit or suspend further sales of access lines to any ISP served by the switch until other congestion relilef steps can be taken.

e. We suggest that Bell's marketing and sales agents - or some other Company group – identify ISPs *as* ISPs when they order line-side connections, closely monitor each ISP's line-side growth, and request *additional* voice line projections at least every 6 months.

f. When ISPs are just starting out and begin operations on Bell's network by ordering a small number of voice lines, we suggest Bell consdier

developing a program to explain to the ISPs the benefits (and *necessity*) of their eventually moving to trunk-side connections.

g. Bell switches in Maine have become congested because the Company either underestimated actual peak traffic loads that have occurred at the switches or, for whatever reason, failed to adequately time and size the capacities, and capacity upgrades, of those switches and their umbilical trunks. We suggest Bell consider making major improvements in how it estimates switch busy hour traffic loads, or in how it times and sizes switch and umbilical capacity and capacity upgrades, or both.

h. When Bell's Network Administration Center determines a capacity upgrade is necessary to relieve a congested switch, and Bell's network planners (the Switch Planning and Capacity Management Department) disagree with either the necessity of the upgrade or its timing, then because the network planners sized - and may well have undersized - the capacity of the congested switch, we suggest Bell consider having a third Bell Atlantic party, *not* the network planners and not the NAC, make the decision on the upgrade and its timing.

i. We suggest Bell consider giving the relief of network congestion the same priority it gives to relieving conditions caused by an emergency.

2. Network Monitoring

a. Bell needs to drastically reduce the time it takes to detect and fully relieve network congestion. At least for congested and potentially congested switches, we suggest Bell consider developing the capability to monitor - *graphically*, and *in real time* - the events that most reflect congestion in the network, be it located in analog and digital line concentration units, umbilicals, interoffice trunks, or intra-switch module links.

b. For each performance measurement in Bell's network monitoring system that reflects network congestion - especially measurements of no dial tone, slow dial tone, and blocked calls - we suggest the Company consider developing a threshold that will trigger *immediate congestion relief*, be it immediate load balancing, or, if that does not fully relieve the congestion, immediate addition of line units, umbilicals, or trunks - whichever network components are causing the congestion.

c. In both its automated network monitoring system and the customer trouble report coding done by Centralized Service Bureau (repair center) intake personnel, we suggest Bell consider developing the capability to distinguish no dial tone, delayed dial tone, blocked call and other events caused by *network congestion* from the same events caused by downed lines, faulty customer equipment, or other reasons.

d. We suggest Bell consider developing the capability to detect and measure no dial tone events *as* no dial tone, rather than as *delayed* dial tone events.

e. Bell's High Day Report provides usage and call blocking data for the 15 highest high day-busy hours over the period the report is selected to cover. The report can be run for each line unit (both analog and digital) in a switch module, for umbilicals, for Interoffice trunks, and for links between switch modules. According to Bell, this most informative report on congestion is usually run only once a year, as an input to planning capacity upgrades. For each congested and potentially congested switch, we suggest Bell consider running the High Day Report every 15 days, until at least a month after the congestion is fully relieved.

3. Tariffs, Service Offerings, and Pricing

Two classes of customers contribute to the load on line units and trunks: the first includes ISPs and any other customers with line-side switch connections that receive a large number of calls with long holding times during the busy period; the other includes customers with line side connections who originate calls during the busy period with extremely long holding times, typically customers calling an ISP. We suggest Bell consider developing tariff solutions to reduce network congestion by encouraging or requiring both classes of users not to use line-side connections for data traffic. In the long term, we suggest Bell considering trying to move all data users off its public switched voice network.

Possible solutions include the following:[18]

1. We suggest that Bell consider not making low-cost line-side offerings (e.g. Centrex lines) available to either originating or terminating end users who generate long holding time data traffic, unless those end users demonstrate that most of the use of those lines will be to communicate on the premises of that end user. Centrex lines are priced lower than regular line-side business lines so that the Company can compete with Private Branch Exchange (PBX)[19] service providers. Therefore, we suggest Bell consider making the low rate applicable only to PBX-like solutions. A practice which allows any end user to purchase lower cost Centrex lines provides an economic incentive for an ISP to take a service which is likely to cause switch congestion. ISPs are also less likely to voluntarily subscribe to trunk side connections if line-side services available to them are priced very low.

[18] Some of the suggested solutions would require modifications to Bell's Maine tariff.

[19] A PBX is a telephone switching machine large businesses may use to distribute calls to and from their employees. A PBX is connected by trunks to the central office switch of the business's local exchange company, and is a smaller, less powerful version of that switch.

2. We suggest that business lines providing line-side connections hould not be provided to end users with a high terminating traffic-to-total-traffic ratio and with terminating traffic over a certain threshold usage amount during any one-hour period; that such users be limited to one or two line-side connections during a transition period; and that ultimately they be required to subscribe to trunk-side connections and digital data services.

3. We suggest that originating end users (those calling ISPs) be encouraged not to leave their line off hook unless they are actually communicating with the ISP; that customers be informed that leaving their line in use all the time contributes to delaying dial tone and blocking the calls of other users; and that Bell consider developing a plan to deal with those customers who persist in engaging their line all the time.

4. We suggest that Bell Atlantic consider: (a) pricing trunk side digital data services in order to make those services economically attractive to ISPs and other large volume users; (b) making the ratio between price and cost for trunk-side connections and other digital access services likely to be used by ISPs no greater than that same ratio for analog line-side connections; (c) accounting for the avoided cost of not having to make analog line unit additions when pricing digital trunk-side services; and (d) pricing digital trunk-side services on a flat rate basis so they will be attractive when compared to flat rated analog services.

C. To Improve Bell's Long Term Approaches to Prevent Congestion

1. Even if Bell is able to move all ISPs off the line sides of its switches, *Internet users* will still impose long holding time loads on line units and interoffice trunking. Those loads will increase as more and more customers subscribe to ISPs' services. Unless Internet users and other long-holding-time customers migrate to a data network, substantial increases in the voice network's switching and trunking capacity will be necessary. Therefore, we suggest Bell consider developing a plan to aggressively move all data users off the voice network. That plan could include making xDSL[20] services available in all areas of Maine on an expedited basis, and making ISDN[21] and frame relay services available everywhere at attractive rates. Where ISDN cannot be provided by a customer's local switch, it could be made available on a Foreign Exchange-like basis without the customer facing additional charges because of

[20]In "xDSL," DSL stands for Digital Subscribe Line, a technology that enables high speed data transmission over copper cables. There are several DSL technologies, anyone of which the "x" in xDSL can stand for.

[21]"ISDN," which stands for Integrated Services Digital Network, is a trunk-side digital service that delivers voice and data signals simultaneously.

that serving arrangement.[22] The availability of services like xDSL, ISDN, and frame relay are critical to the objective to remove from the voice network the data usage of those customers who originate calls to an ISP (i.e., Internet users). With the numbers of customers having computers and using the Internet growing rapidly, it is imperative to provide these customers with alternatives to reach the Internet. Otherwise, unless Bell Atlantic makes very substantial capacity additions to its voice network in Maine, the network congestion we have seen thus far will be small compared to what we will face in the future.

2. Until Bell's voice network in Maine no longer carries a significant amount of either originating or terminating Internet traffic, we suggest Bell consider developing the capability to forecast the impact that the growth in Internet traffic will have on its voice switches and interoffice network, and plan their call handling capacities accordingly.

[22]"Foreign Exchange" service enables a customer to obtain a telephone number in an exchange outside the customer's local (toll-free) calling area (and outside the exchange's local calling area) and receive calls from and make calls to that exchange that are toll-free.

IX. REPORTING REQUIRED

Each month, Bell Atlantic should file the following information:

A. High Day Reports covering each month for all switches that exceed the Company's line unit, switch module link, umbilical trunk, or interoffice trunk congestion thresholds by more than 20%;

B. reports that contain "peg counts" of delayed dial tones, blocked calls, and any other congestion-related events the Company's network monitoring system measures, for all switches that exceed the Company's thresholds for one or more of these events by more than 20%;

C. monthly updates of the ISPs that change from line-side to trunk-side serving arrangements. The report should indicate the switch or switches that serve each ISP and the number of voice-grade lines ISPs still have that are used for Internet traffic; and

D. monthly updates of congested and potentially congested switches. For each switch, the report should indicate which components are congested (line units, umbilicals, trunks), the planned congestion relief methods, and the date the Company expects the congestion to be fully relieved.

X. ORDERING PARAGRAPHS

In this Order we have found problems with Bell Atlantic's network management, monitoring, and congestion relief practices. Accordingly, we order Bell Atlantic to:

1. File a report within 60 days of the date of this Order explaining in detail the steps it will take to ensure that no Bell Atlantic customer in Maine will be unable to obtain a dial tone and complete an emergency telephone call because of avoidable congestion in the Company's network. The report should include the Company's plans:

   a. to minimize occurrences of avoidable congestion in its Maine network;

   b. to improve its internal reporting and communications on network congestion;

   c. to improve its network monitoring and management practices related to detecting network congestion and minimizing its impacts on customers;

   d. to improve and speed up its network congestion relief practices; and

   e. to prevent avoidable congestion from occurring in its Maine network.

2. File the reports required in Section IX of this Order.

Dated at Augusta, Maine, this 21st day of July, 1999.

BY ORDER OF THE COMMISSION

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Raymond J. Robichaud
Assistant Administrative Director

COMMISSIONERS VOTING FOR: Welch
Nugent
Diamond

Attachment 1

A Brief Description of Bell Atlantic's Network in Maine

Bell Atlantic's network in Maine consists of a number of large "host" switches, which serve large communities, and a much larger number of smaller "remote" switches, which serve smaller communities. Switches route calls to their destinations, and are located in Bell's "Central Offices." All host switches are connected to each other by high capacity lines called "trunks." Each remote switch is connected to one and only host switch by trunks called "umbilicals." Residential and business customer lines are connected to the "line side" of their local switch, which is either a host or a remote switch. Trunks, umbilicals, and high capacity business lines are connected to the "trunk side" of a switch. (An Internet Service Provider can have both line-side and trunk-side connections to its local switch.)

Bell also has a large "tandem" switch in Maine, to which the host switches are connected, and which also serves as the point at which Bell and other telephone companies access each others' networks. No customer lines are connected to the tandem switch, only trunks from other Bell switches and from other companies' switches.

Figure 1 on the next page is a simplified diagram of Bell's network in Maine.